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JOSEPH R. KELLY  
WESTMAN, CHAMPLIN & KELLY, P.A.  
INTERNATINAL CENTRE  
900 SECOND AVENUE - SUITE 900  
MINNEAPOLIS, MN 55402-3319

EXAMINER

VO, HUYEN X

ART UNIT PAPER NUMBER

2655

4

DATE MAILED: 04/30/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

09/842,416

Applicant(s)

ACERO ET AL.

Examiner

Huyen Vo

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– The MAILING DATE of this communication appears on the cover sheet with the correspondence address –  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 4/25/2001.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 25 April 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)             | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)    | Paper No(s)/Mail Date. _____  |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____   | 6) <input type="checkbox"/> Other: _____                                    |

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## **DETAILED ACTION**

### ***Claim Rejections - 35 USC § 112***

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 11-13 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.
3. Regarding claims 11-13, it is not clear why the number of reconstruction filters is determined through the employing step and the solving step since the number of reconstruction filters has already been determined in the determining step. Appropriate correction is required.

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –  
(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-6 are rejected under 35 U.S.C. 102(e) as being anticipated by Attias (US Patent No. 6185309).

4. Regarding claim 1, Attias discloses a method comprising:

recording a number of input sound source signals by a number of sound input devices, the number of sound input devices at least equal to the number of input sound source signals, to generate a number of sound input device signals at least equal to the number of input sound source signals, the number of input sound source signals including a target input sound source signal and acoustical factor signals (col. 5, In. 32 to col. 6, In. 28 or referring to figures 1-2, acoustical factor signals are signals reflecting off the wall); and,

applying a number of reconstruction filters to the number of sound input device signals according to a convolutional mixing independent component analysis (ICA) to generate at least one reconstructed input sound source signal separating the target input sound source signal from the number of sound input device signals without permutation, the number of reconstruction filters taking into account a priori knowledge regarding the target input sound source signal, one of the at least one reconstructed input sound source signal corresponding to the target input sound source signal (col. 6, In. 29-52 and the CONVOLUTIVE MIXING SECTION on col. 9, In. 51 to col. 12, In. 50, this section is devoted to explain the method claimed above).

5. Regarding claims 2-4, Attias further discloses that each of the number of sound input devices is a microphone (col. 5, In. 49-52), the target input sound source signals corresponds to human speech (col. 5, In. 49-52), and the acoustical factor signals include reverberation (figure 2, reflecting signals).

6. Regarding claim 5, Attias further discloses that at least one of the input sound source signals exhibits correlation over time (col. 7, ln. 24-46, taking the fact that the sources are independent and zero-mean. Zero-mean indicates correlation over time).

7. Regarding claim 6, Attias further discloses that the a priori knowledge regarding the target input sound source signal is an estimate of spectra of the target input sound source signal (col. 8, ln. 1-43, by approximating  $S_{sub.k}$ ).

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Attias (US Patent No. 6185309) in view of Weinstein et al. (US Patent No. 5208786).

8. Regarding claim 7, Attias does not disclose that the number of reconstruction filters is constructed based on a speech recognition system, such that the one of the at least one reconstructed input sound source signal corresponding to the target input sound source signal is matched against a plurality of words of a dictionary of the speech recognition system, a high probability match indicating that proper separation has

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occurred. However, Weinstein et al. teach that a method for separating signals for used in a speech recognition system (figure 7 or col. 12, ln. 58 to col. 13, ln. 7). The advantage of using the teaching of Weinstein et al. in Attias is to enable the system to provide speech recognition services to a signal that is distorted by interferences.

Since Attias and Weinstein et al. are analogous art because they are from the same field of endeavors, it would have been obvious to one of ordinary skill in the art at the time of invention to modify Attias by incorporating the teaching of Weinstein et al. in order to enable the system to provide speech recognition services to a signal that is distorted by interferences to enhance system's capability.

The modified Attias still fail to disclose that the number of reconstruction filters is constructed based on a speech recognition system such that the one of the at least one reconstructed input sound source signal corresponding to the target input sound source signal is matched against a plurality of words of a dictionary of the speech recognition system, a high probability match indicating that proper separation has occurred. However, it would have been obvious to one of ordinary skill in the art at the time of invention to readily realize that a high matching probability of the signal to words stored in a dictionary would suggest that the signal is valid and the separation is proper.

Claims 8-10 and 14-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Attias (US Patent No. 6185309) in view of Hosoda et al. (US Patent No. 5727122).

9. Regarding claim 8, Attias fails to specifically disclose that the number of reconstruction filters is constructed based on a vector quantization (VQ) codebook of vectors, the vectors representing sound source patterns typical of the target input sound source signal, such that the one of the at least one reconstructed input sound source signal corresponding to the target input sound source signal is matched against the vectors of the VQ codebook, a high probability match indicating that proper separation has occurred.

However, Hosoda et al. teach that the number of reconstruction filters is constructed based on a vector quantization (VQ) codebook of vectors, the vectors representing sound source patterns typical of the target input sound source signal, such that the one of the at least one reconstructed input sound source signal corresponding to the target input sound source signal is matched against the vectors of the VQ codebook, a high probability match indicating that proper separation has occurred (*figures 1 or 3, the operation of figure 1 is well known to a person of ordinary skill in the art. Codevectors that produce a signal that is most similar to original signal is selected and indicative of a properly separation of signal*). The advantage of using the teaching of Hosoda et al. in Attias is to analyze signal by pattern matching rather than determining the probability to reduce computing power and processing time.

Since Attias and Hosoda et al. are analogous art because they are from the same field of endeavors, it would have been obvious to one of ordinary skill in the art at the time of invention to modify Attias by incorporating the teaching of Hosoda et al. in

order to analyze signal by pattern matching rather than determining the probability to reduce computing power and processing time.

10. Regarding claim 9, the modified Attias fails to specifically disclose that the vectors are linear prediction (LPC) vectors. However, Hosoda et al. further teach that the vectors are linear prediction (LPC) vectors (col. 4, ln. 16-67). The advantage of using the teaching of Hosoda et al. in the modified Attias is to provide retrieval information associated with codevectors that produce a signal that is used to compare with the original signal.

Since the modified Attias and Hosoda et al. are analogous art because they are from the same field of endeavors, it would have been obvious to one of ordinary skill in the art at the time of invention to further modify Attias by incorporating the teaching of Hosoda et al. in order to provide retrieval information associated with codevectors that produce a signal that is used to compare with the original signal.

11. Regarding claim 10, Attias does not disclose a machine-readable medium having instructions stored thereon for execution by a processor to perform the method of claim 1. However, it would have been obvious to one of ordinary skill in the art at the time of invention to implement the method of claim 1 in a software program to provide convenience for maintenance and used in different computing devices.



12. Regarding claim 14, Attias discloses a method for constructing a number of reconstruction filters to separate a target input sound source signal from a number of sound input device signals without permutation according to a convolutional mixing independent component analysis (ICA) (col. 6, ln. 29-52 and the CONCOLUTIVE MIXING SECTION on col. 9, ln. 51 to col. 12, ln. 50), comprising:

minimizing the prediction error to obtain an estimate of the number of reconstruction filters (col. 11, ln. 15-46, minimum prediction error is achieved by minimizing the Kullback-Leibler (KL) distance); and, solving the prediction error as minimized to generate the number of reconstruction filters (col. 11, ln. 35 to col. 12, ln. 30, after minimizing the KL distance, update rule is generated to update the separating matrix G at each iteration).

Attias does not disclose a method for determining a prediction error based on a vector quantization (VQ) codebook of vectors, the vectors representing sound patterns typical of the target input sound source signal, such that matching the vectors to a reconstructed signal is indicative of whether the reconstructed signal has been properly separated.

However, Hosoda et al. teach a method for determining a prediction error based on a vector quantization (VQ) codebook of vectors, the vectors representing sound patterns typical of the target input sound source signal, such that matching the vectors to a reconstructed signal is indicative of whether the reconstructed signal has been properly separated (figures 1 or 3, *the operation of figure 1 is well known to a person of ordinary skill in the art. Codevectors that produce a signal that is most similar to original*

*signal is selected and indicative of a properly separation of signal*). The advantage of using the teaching of Hosoda et al. in Attias is to analyze signal by pattern matching rather than by determining the probability.

Since Attias and Hosoda et al. are analogous art because they are from the same field of endeavors, it would have been obvious to one of ordinary skill in the art at the time of invention to modify Attias by incorporating the teaching of Hosoda et al. in order to analyze signal by pattern matching rather than by determining the probability to reduce computing power and processing time.

13. Regarding claim 15, Attias further discloses that the VQ codebook of vectors encapsulates a priori knowledge of the target input sound source signal as human speech patterns, where the target sound source signal corresponds to human speech (col. 6, ln. 21-28, hearing aids application indicates speech signal, which is a priori knowledge of the target input signal).

14. Regarding claim 16, the modified Attias does not disclose that the vectors are linear prediction (LPC) vectors, and the prediction error is a linear prediction (LPC) error. However, Hosoda et al. further teach that the vectors are linear prediction (LPC) vectors, and the prediction error is a linear prediction (LPC) error (col. 4, ln. 16-67, CELP coding is well known). The advantage of using the teaching of Hosoda et al. in the modified Attias is to compare and select codevectors that produce a signal that is most similar to the original signal.

Since the modified Attias and Hosoda et al. are analogous art because they are from the same field of endeavors, it would have been obvious to one of ordinary skill in the art at the time of invention to further modify Attias by incorporating the teaching of Hosoda et al. in order to minimize error by selecting codevectors that produce a signal that is most representative of the original signal.

15. Regarding claims 17-19, the modified Attias does not disclose that solving the prediction error as minimized to generate the number of reconstruction filters comprises using an expectation maximization (EM) approach and an E-step of the EM approach determines a best codeword within the VQ codebook of vectors and an M-step of the EM approach minimizes the prediction error and an E-step of the EM approach determines a best codeword within the VQ codebook of vectors and an M-step of the EM approach minimizes the prediction error.

However, Hosoda et al. further teach that solving the prediction error as minimized to generate the number of reconstruction filters comprises using an expectation maximization (EM) approach (*the operation of selecting the best codevector in figure 1*) and an E-step of the EM approach determines a best codeword within the VQ codebook of vectors and an M-step of the EM approach minimizes the prediction error (*figure 1, The prediction error is reduced by selecting codevectors that produce a signal that is most similar to the original signal, which is well known to a person of ordinary skill in the art*). The advantage of using the teaching of Hosoda et al. in the modified Attias is to minimize prediction error to produce a signal that is most representative of the original signal.

Since the modified Attias and Hosoda et al. are analogous art because they are from the same field of endeavors, it would have been obvious to one of ordinary skill in the art at the time of invention to further modify Attias by incorporating the teaching of Hosoda et al. in order to minimize prediction error to produce a signal that is most representative of the original signal.

16. Regarding claim 20, Attias does not disclose a machine-readable medium having instructions stored thereon for execution by a processor to perform the method of claim 14. However, it would have been obvious to one of ordinary skill in the art at the time of invention to implement the method of claim 14 in a software program to provide convenience for maintenance and used in different computing devices.

### ***Conclusion***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. J. -L. Gauvain (IEEE) discloses a MAP estimation for multivariate gaussian mixture observations of Markov Chains that is considered pertinent to the claimed invention.

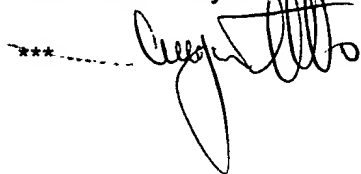
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Huyen Vo whose telephone number is 703-305-8665. The examiner can normally be reached on M-F, 9-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Doris To can be reached on 703-305-4827. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Examiner Huyen X. Vo

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April 10, 2004



**DORIS H. TO**  
**SUPERVISORY PATENT EXAMINER**  
**TECHNOLOGY CENTER 2600**